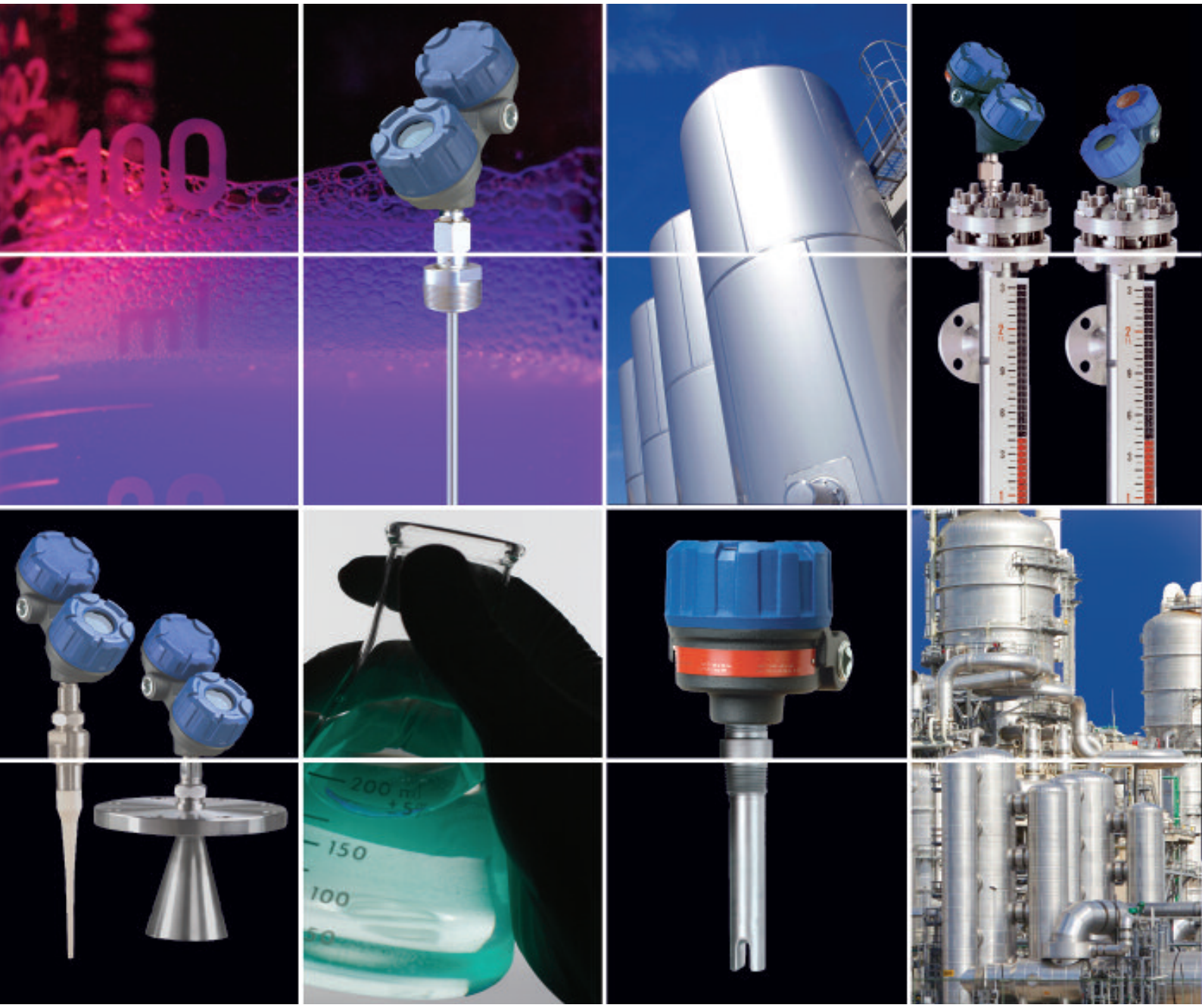
TILLQUIST

CHEMICAL INDUSTRY



A Guide to Level and Flow Controls for the Chemical Industry

Magnetrol®

Leading Level and Flow
Chemical Applications

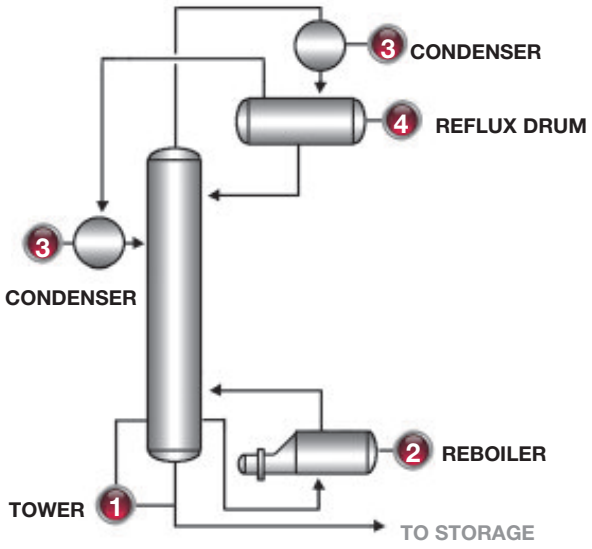
Liquid Level Applications:

The following level applications utilize level instruments for process control. A separate alarm using a different technology often serves as a back-up for spill detection.

1. Distillation Tower
2. Reboiler
3. Condenser
4. Reflux Drum
5. Liquid Extraction
6. Vapor/Liquid Separation
7. Scrubber Vessel
8. Mixing & Blending
9. Chemical Reactor
10. Fermentation Vessel
11. Steam Drum
12. Surge Drum
13. Catalysis Vessel
14. Chlor-Alkali Process
15. Chemical Injection
16. Deionization Tank
17. Waste Sump
18. Neutralization
19. Liquids Storage
20. Liquefied Gas Storage

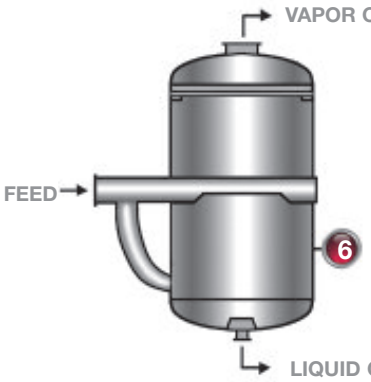
Flow Applications:

21. Mass Air & Compressed Air
22. Process & Waste Gases
23. Tank Blanketing
24. Pump Protection

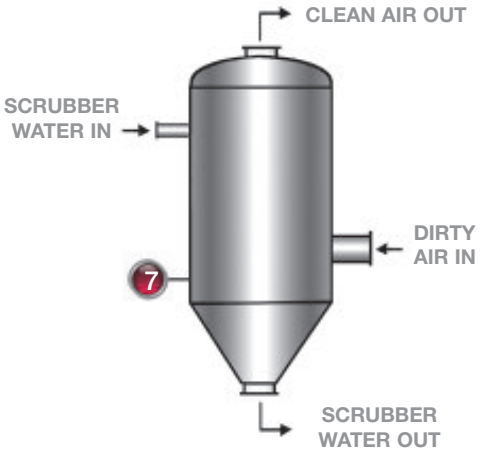


1-4: Distillation

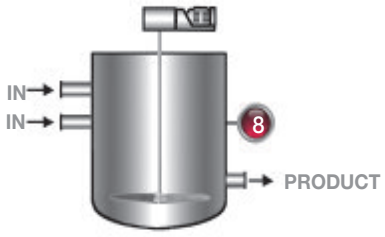
5: Liquid Extraction



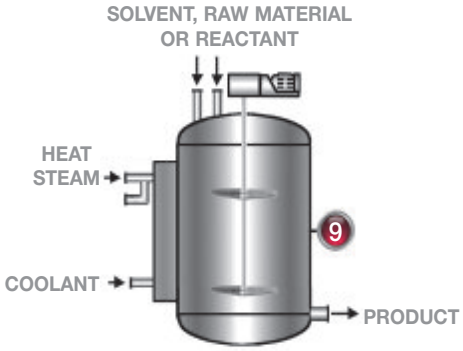
6: Vapor/Liquid Separation



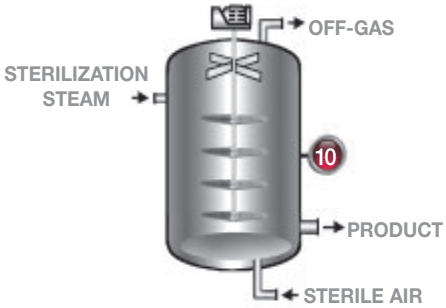
7: Scrubber Vessel



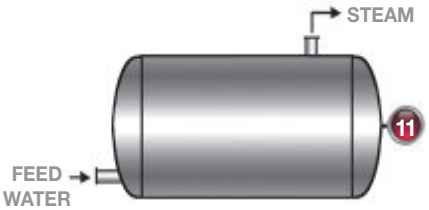
8: Mixing Vessel



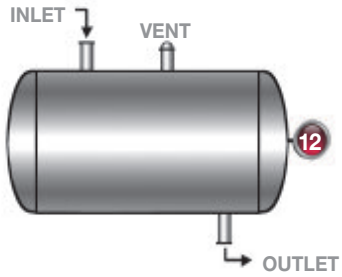
9: Chemical Reactor



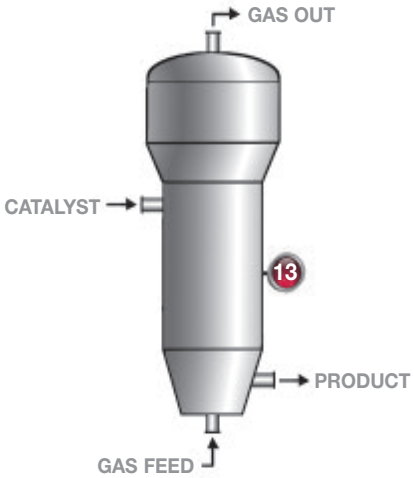
10: Fermentation Vessel



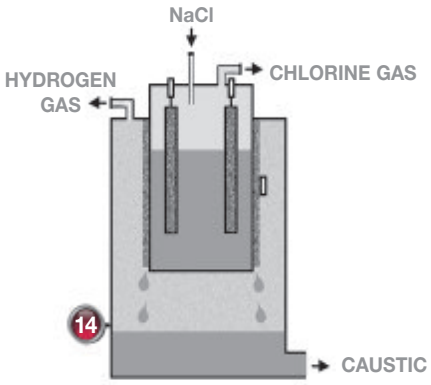
11: Steam Drum



12: Surge Drum

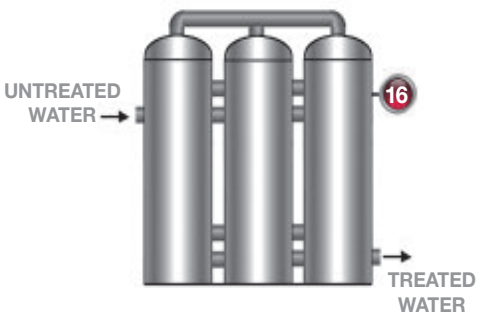


13: Catalysis Vessel

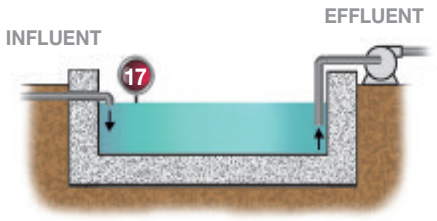


14: Chlor-Alkali

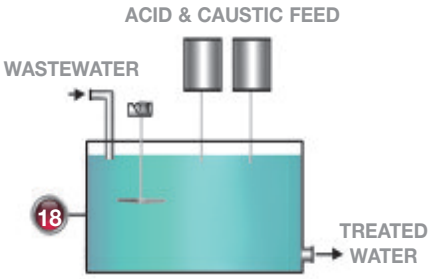
15: Chemical Injection



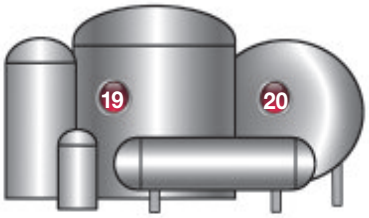
16: Deionization



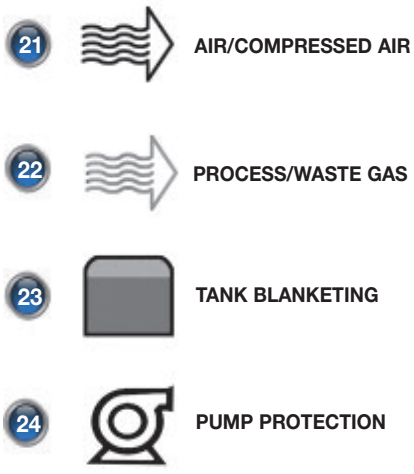
17: Waste Sump



18: Neutralization



19-20: Storage Tanks



21-24: Flow Applications

1 DISTILLATION TOWER

Application: Selecting a separation technology from among 20 leading varieties depends upon a chemical's nature, the number of phases, and the capacity, speed and efficiency required. Distillation—separating substances based on differences in volatilities—is the most widely used separation and purification method. Today, approximately 40,000 distillation towers are operating in U.S. chemical plants.

Challenges: Level measurement at the bottom of a distillation tower controls the "bottoms" product rate. Poor level control could allow liquid to back up over the stripping trays causing damage and reduced yields. Too low level may cause pump cavitation. In related extraction towers, interface level control provides optimal separation from associated substances.

INSTRUMENTATION

▲ **Point Level:** Series 3 Float-Actuated External Cage Level Switch

▲ **Continuous Level:** Eclipse® Model 705 Guided Wave Radar or E3 Modulevel® Displacer-Actuated Transmitter

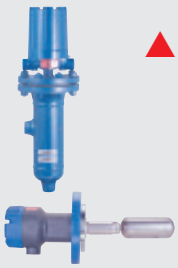
▲ **Visual Indication:** Atlas™ or Aurora® Magnetic Level Indicators can be supplied with switches or transmitters

2 REBOILER

Application: Reboilers, or vaporizers, are heat exchangers that provide heat to the bottom of a distillation tower. They boil the bottom liquid to generate vapors which are returned to the tower to drive the distillation separation process. The reboiler may partially or completely vaporize the stream it receives from the bottom of the tower.

Challenges: Excess reboiler liquids (bottoms or blow-down) overflow a baffle where level is controlled by means of a level controller. If the reboiler level becomes too low, it will affect the maximum flow rate of bottoms product that can be drawn off. Inaccurate reboiler level can also degrade composition control for material balance control configurations.

INSTRUMENTATION



▲ **Point Level:** Series 3 Float-Actuated External Cage Level Switch or Tuffy® II Float-Actuated Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar or E3 MODULEVEL Displacer-Actuated Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

3 CONDENSER

Glycol Regeneration with Condensers

Application: A heat transfer process that changes a gas or vapor to a liquid, condensation is employed in the reflux process to improve the efficiency of distillation. Condensation can also be employed for producing saturated liquid products, for sub-cooling, or to serve an environmental or vapor recovery function. Condensation is carried out in a variety of configurations.

Challenges: In the distillation process, tower vapors are condensed prior to entering an accumulator. The condenser's level can be used to control tower pressure where the liquid level set point serves as the manipulated variable (MV) for the pressure controller. Adjusting liquid level in the condenser changes the effective heat-transfer area.

INSTRUMENTATION

▲ **Point Level:** Series 3 Float-Actuated External Cage Level Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

4 REFLUX DRUM


Reflux Drum

Application: Large-scale distillation towers use a reflux system to achieve a more complete product separation. Reflux is that portion of a tower's condensed overhead liquid product that is cycled back to the top of the tower where it flows downward to provide cooling and condensation of the upflowing vapors.

Challenges: The reflux drum, or accumulator, serves as a distribution point for reflux and distillate. Condensed liquid leaves the reflux drum under level control. Drum level control is critical to ensure that the proper amount of reflux will return to the distillation tower. Poor liquid level indication can cause expensive operating problems and product degradation.

INSTRUMENTATION

▲ **Point Level:** Series 3 Float-Actuated External Cage Level Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar Transmitter or E3 MODULEVEL Displacer-Actuated Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

5 LIQUID EXTRACTION


Extraction

Application: Liquid-liquid extraction (LLX), or solvent extraction or partitioning, is a selective separation procedure for isolating and concentrating a valuable substance from an aqueous solution by using an organic solvent. LLX can serve as an alternative when distillation is ineffective. LLX is used in pharmaceutical, food and agricultural processing, organic and inorganic chemistry, hydrometallurgy and fragrances.

Challenges: In mixer-settler type extraction, feed and solvent tanks are monitored for level. The feed and solvent are thoroughly blended in a mixer-settler chamber and the mixture overflows into a separation chamber where it settles into light and heavy phases. The separate phases are monitored and removed on interfacial level control.

INSTRUMENTATION

▲ **Point Level:** Series 3 Float-Actuated External Cage Level Switch or Thermatel® Model TD1/TD2 Thermal Dispersion Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar Transmitter or E3 MODULEVEL Displacer-Actuated Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

6 VAPOR/LIQUID SEPARATION


Flare K/O Drum

Application: Where the separation of vapors and liquids is required, a separator drum, or knockout pot, flash drum, or compressor suction drum, is integrated into the process unit. The separation vessel receives the flashing liquid mixture where the liquid is subsequently gravity separated and falls to the bottom as the vapor exits at the top.

Challenges: Typically, a collection tank located beneath the separation chamber collects the liquid by gravity flow and utilizes a liquid level control for liquid withdrawal. The control also maintains a vapor barrier while discharging the collected liquid at the same rate of accumulation. In some separators, such as flash drums, liquid level must be kept within an extremely narrow span for very tight control.

INSTRUMENTATION

▲ **Point Level:** Echotel® Model 961 Ultrasonic Switch or THERMATEL Model TD1/TD2 Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar Transmitter or Jupiter® Magnetostrictive Level Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

7 SCRUBBER VESSEL


Natural Gas Scrubbers

Application: Scrubbers remove odors, pollutants, acid gases and chemical wastes from air and liquid streams. In a wet scrubber, the polluted stream flows counter currently past water or a liquid chemical which removes the undesirable component of the gas or liquid. Chemical scrubbing typically requires large amounts of caustic chemicals.

Challenges: Accurate level monitoring of the scrubbing water necessitates a control to automatically feed the correct amount of make-up water to the recycle reservoir either continuously or on a periodic basis. Located in the wet scrubber shell, the level monitoring device for water-out control should be equipped with a level alarm.

INSTRUMENTATION

▲ **Point Level:** ECHOTEL Model 961 Ultrasonic Switch or THERMATEL Model TD1/TD2 Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar Transmitter or JUPITER Magnetostrictive Level Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

8 MIXING & BLENDING


Mixing Tank

Application: Mixing and blending of liquid ingredients is essential throughout the broader chemical industry. In-line and skid mounted systems include batch and continuous mixing for liquid/liquid formulation and blending. An impeller in the process vessel accomplishes the mixing of miscible liquids.

Challenges: A mixing and blending system can be as simple as a vessel with an agitator and graduate in complexity to a fully skid-mounted PLC controlled system with heating, cooling, homogenization and steam injection capabilities. Level controls monitor tank and vessel levels and trigger alarms in underfill and overfill incidents.

INSTRUMENTATION

▲ **Point Level:** Series 3 Float-Actuated External Cage Level Switch

▲ **Continuous Level:** Pulsar® Model RX5 Pulse Burst Radar Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

9 CHEMICAL REACTOR


Chemical Reactor

Application: Chemical, polymerization and pharmaceutical processes utilize reactor vessels to contain chemical reactions. Chemical reaction speed and product quality are frequently controlled by an external heat exchanger for elevating temperature and a cryogenic system for lowering temperature. Reactors typically contain impellers for product mixing.

Challenges: Level instrumentation in a tank-type reactor vessel must contend with diverse and often aggressive product chemistries, agitation, mixing, surface foam and temperature and pressure variations. Low level monitoring in the discharge line, high level monitoring in the vessel, and interfacial measurement of the foam/emulsion interface is recommended.

INSTRUMENTATION

▲ **Point Level:** Series 3 Float-Actuated External Cage Level Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

10 FERMENTATION VESSEL


Fermentation Vessel

Application: Industrial fermentation is the process of breaking down organic substances and re-assembling them in order to produce other chemical compounds. Alternative fuels like ethanol and chemicals such as methanol and a wide range of acids can be developed using this process. Chemical fermentation takes place in large tanks called fermenters in a process that can either be aerobic or anaerobic.

Challenges: Depending upon the type of fermentation vessel and the media being processed, the level control often must contend with agitation and aeration. Froth or foam is typically generated because fermentation agents have surfactant properties. When processing acids, contact level controls must tolerate the very aggressive media.

INSTRUMENTATION

▲ **Point Level:** ECHOTEL Model 961 Ultrasonic Level Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

11 STEAM DRUM


Steam Drum

Application: Chemical manufacturers are major users of steam for cleaning, drying, fermentation, steam stripping, and chemical recovery. Steaming-in-place (SIP) is a widely used method for in-line sterilization of vessels, valves, process lines, and filter assemblies. Steam is created in a boiler where heat transforms water under pressure into steam.

Challenges: Boiler drum level control is critical for safe and efficient steam generation. Drum level control maintains level at constant steam load. Too low a level may expose boiler tubes, which will overheat and sustain damage. Too high a level may interfere with separating moisture from steam, which reduces boiler efficiency and carries moisture into the process.

INSTRUMENTATION

▲ **Point Level:** Series 3 Float-Actuated External Cage Level Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar Transmitter or E3 MODULEVEL Displacer-Actuated Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

12 SURGE DRUM


Surge Drum

Application: Surge drums are frequently located between process units to help reduce the effect of flow rate variations between interconnected process units. A low surge drum level can result in reduced capacity while a high level can cause liquid carry-over. In an application characterized by alternating inertia and turbulence, stable level output is highly desirable.

Challenges: Contrary to the normal control objective of keeping a measurement at set point, the purpose of a surge drum level control is to dampen the changes in controlled flow while keeping the liquid level in the vessel between limits. For surge drums it is generally more important to allow levels to "float" in order to minimize flow rate variations.

INSTRUMENTATION

▲ **Point Level:** Model A15 Displacer-Actuated Level Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar Transmitter or E3 MODULEVEL Displacer-Actuated Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

Tillquist

13 CATALYSIS VESSEL


Catalysis Vessel

Application: The catalytic method of converting compounds into other compounds uses a chemical catalyst to increase the rate of a reaction. The catalyst is chemically unchanged after the reaction has occurred and can be recovered from the reaction mixture. Thirty of the top fifty commodity chemicals are created directly by catalysis.

Challenges: In the fluidized bed reactor-regenerator (FBRR) a fluid is passed through the catalyst at high enough velocities to suspend the solid and cause it to behave as though it were a fluid. Measurement in the reactor vessel must contend with severe process conditions. Finished product and, in some configurations, spent catalyst, is on level control.

INSTRUMENTATION

▲ **Point Level:**
Model A15
Displacer-Actuated
Level Switch

▲ **Continuous Level:**
E3 MODULEVEL
Displacer-Actuated
Transmitter

▲ **Visual Indication:**
Typically does not apply

14 CHLOR-ALKALI PROCESS


CA Process

Application: Chlor-alkali (CA) refers to chlorine and caustic soda (NaOH) manufacturing. These are among the top ten chemicals produced worldwide and are main ingredients in the manufacture of pharmaceuticals, detergents, disinfectants, herbicides, pesticides and PVC. Chlorine and caustic soda are made by the electrolysis of brine (NaCl).

Challenges: In the preferred membrane process of CA, level instruments control saturated brine and demineralized water feed, and caustic liquid level. Level control maintains a high enough level in the anode and cathode compartments to ensure membrane saturation, thus preventing any exchange of gases via the membrane in the upper part of the electrolysis cell.

INSTRUMENTATION

▲ **Point Level:**
ECHOTEL Model 961
Ultrasonic Switch or
THERMATEL Model
TD1/TD2 Thermal
Dispersion Switch

▲ **Continuous Level:**
PULSAR Model RX5
Pulse Burst Radar
Transmitter or E3
MODULEVEL
Displacer-Actuated
Transmitter

▲ **Visual Indication:**
Atlas or AURORA
Magnetic Level
Indicators can be
supplied with switches
or transmitters

15 CHEMICAL INJECTION


Chemical Injection Skid

Application: From Active Pharmaceutical Ingredients (APIs) to Vapor Phase Corrosion Inhibitors (VCIs), any one of a thousand additives and agents can be injected into the process stream of a given industry to alter or impart new product properties or enhance processing dynamics. Injection systems and chemical skid systems offer a wide range of dosing control options.

Challenges: A chemical injection system typically consists of one or more chemical supply tanks or drums, a metering tank, a vessel with a mixer (if required), a variable pump, and process controls. Chemical tanks and chemical skid packages require level monitoring to ensure that the tanks do not overfill or run out of feed chemicals.

INSTRUMENTATION

▲ **Point Level:** ECHOTEL Model 961 Ultrasonic Switch; or THERMATEL Model TD1/TD2 Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar; or Enhanced JUPITER Magnetostrictive Level Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

16 DEIONIZATION TANK


Deionization Tanks

Application: Highly purified water is essential in processing premium grade and highly purified products in the chemical, pharmaceutical, beverage, cosmetics and electronics industries. Deionization (DI) is frequently used to remove minerals from water by passing water through two separate ion beds—cation and anion—followed by mixed bed saturation.

Challenges: Multiple bed DI units have pairs of tanks where an optional CO_2 degasser may be placed in between. Single bed DI units incorporate both the cation and anion exchangers mixed in a single tank. In addition to monitoring feed water, a level control in the mixing tank will operate the transfer pump to route the purified water to storage.

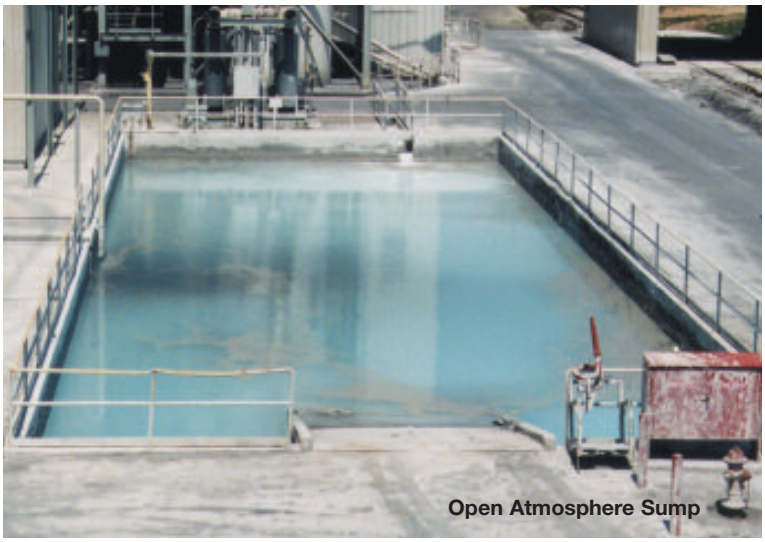
INSTRUMENTATION

▲ **Point Level:** ECHOTEL Model 961 Ultrasonic Switch; or Model T20 Float Level Switch

▲ **Continuous Level:** PULSAR Model RX5 Radar Transmitter; or ECLIPSE Model 705 Guided Wave Radar Level Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

17 WASTE SUMP


Open Atmosphere Sump

Application: Industrial chemical plants generate large volumes of liquid wastes and runoffs that are collected in large open-atmosphere sumps—concrete lift stations, in-ground pits or reservoirs. When the collected liquid reaches a pre-determined level it is discharged for transport to waste storage, treatment, or disposal facilities.

Challenges: Level controls typically actuate a pump to automatically control sump level between two set points. The control can be configured to activate an alarm and a pump shutdown to avoid overfill or pump cavitation in the event of too high or too low levels. Sump level controls must often be robust enough to contend with corrosive media, high solids content and very punishing weather.

INSTRUMENTATION

▲ **Point Level:** Model A10 Displacer-Actuated Level Switch

▲ **Continuous Level:** ECHOTEL Model 338 Ultrasonic Transmitter

▲ **Visual Indication:** Typically does not apply

18 NEUTRALIZATION


Neutralization Tank

Application: To protect neighboring water systems, industrial wastewater must be neutralized so that it is neither acidic nor alkaline prior to its discharge. The neutralization process takes place in a tank where aqueous solutions of an acid and a base are added to wastewater. Sulfuric acid, sodium hydroxide and calcium carbonate are most commonly used.

Challenges: Level is measured in the neutralization and chemical regeneration tanks which typically involve agitation and aggressive chemicals. Ideally, the tank level monitoring system should be easily removable for frequent cleaning. Contact level sensors should be single rod types to avoid media buildup.

INSTRUMENTATION

▲ **Point Level:** ECHOTEL Model 961 Ultrasonic Level Switch

▲ **Continuous Level:** PULSAR Model RX5 Pulse Burst Radar Transmitter or ECHOTEL Model 338 Ultrasonic Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

19 LIQUIDS STORAGE


Field Storage

Application: Liquids stored at chemical plants include water (potable, demineralized, fire, cooling), ingredients and finished product storage. Hazardous chemicals include inorganic acids, buffers, ammonia, chlorine, and solvents. Tanks range in size from small plastic totes to large steel tanks. The chemical stored and the tank type largely determine the level control used.

Challenges: Level instruments indicate inventory levels and protect against tank overfills and underfills that cavitate pumps. As some chemicals are corrosive enough to destroy contact sensors, or can crystallize and coat sensors to render them ineffective, non-contact level monitoring, resistant materials, by-pass chambers and redundant controls are sometimes used.

INSTRUMENTATION

▲ **Point Level:** Model A10 Displacer-Actuated Level Switch

▲ **Continuous Level:** PULSAR Model RX5 Pulse Burst Radar Transmitter or ECHOTEL Model 338 Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

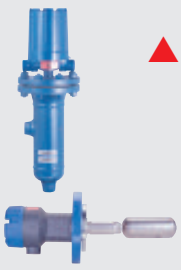
20 LIQUEFIED GAS STORAGE


Liquefied Gas Storage

Application: Gases are frequently converted to a liquid to facilitate convenient storage. Many liquefy by cooling at normal atmospheric pressure while others require pressurization as well. Industrial gases commonly stored in this fashion include liquid oxygen, liquid nitrogen, liquefied chlorine, LPG and LNG Gases are re-vaporized through an application of heat.

Challenges: Above or below ground insulated storage tanks are built to specifically hold liquefied gases and minimize the amount of evaporation. Liquefied gas tank level monitoring typically contends with pressurization, extremely low temperatures and low dielectric media. Contact and non-contact measurement sensors may require a standpipe.

INSTRUMENTATION

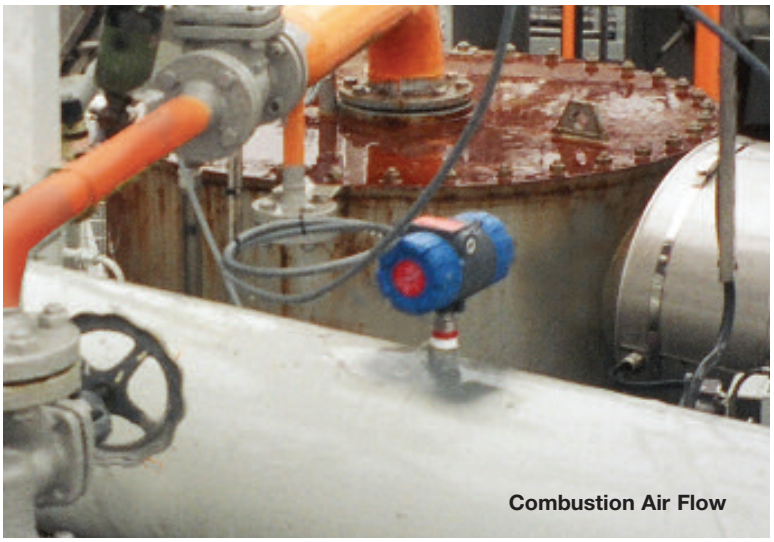


▲ **Point Level:** Series 3 Float-Actuated External Cage Switch or TUFFY II Float-Actuated Switch

▲ **Continuous Level:** ECLIPSE Model 705 Guided Wave Radar or PULSAR Model RX5 Pulse Burst Radar Transmitter

▲ **Visual Indication:** Atlas or AURORA Magnetic Level Indicators can be supplied with switches or transmitters

21 MASS AIR & COMPRESSED AIR FLOW



Combustion Air Flow

Application: The flow of air is monitored in nearly all industrial settings, including applications for processing, air/gas mixing, cooling, blowing & drying, combustion, aeration, ventilation, filtration, and ingredients mixing. Compressed air (CA) is essential for pneumatic tools, materials handling, oxidation, fractionalization, cryogenics, dehydration, filtration and aeration.

Challenges: Significant air-flow variables include pipe diameters, wide flow ranges, varying velocities and low flow sensitivity. Flow meters help ensure efficient operation at rated SCFM output and detect air leaks. A flow meter with a totalizer provides an accurate measurement of CA consumption.

INSTRUMENTATION

▲ **Flow Alarm:**
THERMATEL
Model TD1/TD2
Thermal Dispersion
Flow Switch

▲ **Continuous Flow:**
THERMATEL Model TA2
Thermal Dispersion Mass
Flow Meter

22 PROCESS & WASTE GAS FLOW

Flare Gas Monitoring

Application: Common process gases used in chemical, pharmaceutical, plastics, semi-conductor, food, beverage, and petrochemical processing include compressed air, natural gas, nitrogen, argon, hydrogen, oxygen and carbon dioxide. Industrial waste exhaust gases are present in a wide variety of compositions from benign to toxic. Measurement of the flow of these later gases is often required for reporting environmental emissions.

Challenges: Continuous mass flow measurement of compressed gases help improve plant efficiency. Often these applications require high turndown capabilities and low flow measurement with varying gas pressures and temperatures. Thermal mass flow measurement ideally handles these applications providing high accuracy, high turndown with reliable, dependable operation.

INSTRUMENTATION

▲ **Flow Alarm:**
THERMATEL
Model TD1/TD2
Thermal Dispersion
Flow Switch

▲ **Continuous Flow:**
THERMATEL Model TA2
Thermal Dispersion Mass
Flow Meter

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23 TANK BLANKETING

Field Tanks

Application: Nitrogen—the most widely used commercial gas—is the ideal tank blanketing gas when injected into the vapor space of a storage tank. It prevents ignition of flammable liquids, inhibits vapor loss, and protects chemicals, pharmaceuticals and foods from oxygen and moisture degradation. Nitrogen is also used as a purging agent and in cryogenic applications.

Challenges: Mass flow measurement will monitor the nitrogen blanketing gas. A mass flow meter can track usage as a cost control measure and determine the when, where and by whom of gas usage. Flow monitoring of feed lines can prevent unsafe conditions that may arise when gas supply is insufficient.

INSTRUMENTATION

▲ **Flow Alarm:**
THERMATEL
Model TD1/TD2
Thermal Dispersion
Flow Switch

▲ **Continuous Flow:**
THERMATEL Model TA2
Thermal Dispersion Mass
Flow Meter

24 PUMP PROTECTION


Centrifugal Pumps

Application: Pumps are used throughout chemical operations for moving process fluids. Whether caused by a closed valve, a plugged line downstream or by pump cavitation, pumps operating in a reduced or no-flow condition can overheat and rupture the pump's seal and cause a dangerous deviation in process pressure and temperature.

Challenges: A flow switch along a pump's discharge piping will actuate an alarm and shut down the pump when liquid flow drops below the minimum flow rate. Solid state switches provide the highest level of protection in these instances by offering low flow sensitivity, wide temperature operation and high turndown.

INSTRUMENTATION

▲ **Flow Alarm:**
THERMATEL Model
TD1/TD2 Thermal
Dispersion Flow
Switch

▲ **Pump Protection:**
THERMATEL Model TD1/TD2
Thermal Dispersion Flow Switch

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CHEMICAL INDUSTRY

*AN INDUSTRY GUIDE TO LEVEL MEASUREMENT AND CONTROL FROM **MAGNETROL***

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- ***Nuclear Power***
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- ***Power Generation***
- ***Pulp & Paper Mills***
- ***Renewable Energy***
- ***Steam Generation***
- ***Tank Bridle Level Measurement***
- ***Tank Overfill Prevention***
- ***Understanding Safety Integrity Level (SIL)***
- ***Water & Wastewater***

PLEASE NOTE: The instruments recommended in these brochures are based on field experience with similar applications and are included as a general guide to level and flow control selection. Because all applications differ, however, customers should determine suitability for their own purposes.

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